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PAPERS

IN

MECHANICKS.

MECHANICKS.

The SILVER MEDAL was this session adjudged to Mr. H. SARJEANT, of Whitehaven, in Cumberland, for a MACHINE FOR RAISING WATER; from whom the following Account, Description, and Certificates, were received, together with a Drawing of the Machine.

SIR,

I AM sensible that the little Engine, a drawing of which accompanies this letter, can lay no great claim to novelty in its principle; nevertheless it is respectfully submitted to the consideration of the Society, how far its simplicity, and cheapness of construction, may render it worthy of their attention, with a view to its being more generally known and used in similar cases.

Irton-Hall, the seat of E. L. Irton, Esq. is situated on an ascent of sixty or sixty-one feet perpendicular height; at the foot of which, at the distance of about 140 yards from the offices, runs a small stream of water. The object was to raise this to the house for domestic purposes.

To this end a dam was made at a short distance above, so as to cause a fall of about four feet; and the water was brought by a wooden trough, into which was inserted a piece of two-inch leaden pipe, a part of which is seen at A.

The stream of this pipe is so directed as to run into the bucket B, when the bucket is elevated; but so soon as it begins to descend, the stream flows over it, and goes to supply the wooden trough or well in which the foot of the forcing pump C stands, of three inches bore.

D, is an iron cylinder attached to the pump rod, which passes through it. It is filled with lead, and weighs about 240 lbs. This is the power which works the pump, and forces the water through 420 feet of inch pipe from the pump up to the house.

At E is fixed a cord which, when the bucket comes to within four or five inches of its lowest projection, becomes stretched and opens a valve in the bottom of it, through which the water empties itself.

I beg leave to add, that an engine, in a great degree similar to this, was erected some years ago by the late James Spedding, Esq. for a lead-mine near Keswick, with the addition of a smaller bucket which empied itself into the larger, near the beginning of its descent, without which addition it was found that the beam only acquired a libratory motion, without making a full and effective stroke.

To answer this purpose in a more simple way, I constructed the small Engine in such manner as to finish its stroke (speaking of the bucket end), when the beam comes into an horizontal position, or a little below it. By this means the lever is virtually lengthened in its descent in the proportion of the radius to the cosine, of about thirty degrees, or as seven to six nearly, and consequently its power is increased in an equal proportion.

It is evident that the opening of the valve might have been effected, perhaps better, by a projecting pin at the bottom; but I chose to give an exact description of the Engine as it stands. It has now been six months in use, and completely answers the purpose intended.

The only artists employed, except the plumber, were a country blacksmith and carpenter; and the whole cost, exclusive of the pump and pipes, did not amount to £5.

I am, Sir,

Your humble servant,

H. Sarjeant.

Warwick Court, Holborn.

Mr. Charles Taylor.

In another letter, dated Whitehaven, April 28, 1801, Mr. Sarjeant further observes that the pump requires about eighteen gallons of water in the bucket to raise the counter-weight, and make a fresh stroke in the pump; that it makes three strokes in a minute, and gives about a half-gallon into the cistern at each stroke. He adds, " I speak of what it did in the dryest part of last summer; when it supplied a large family, together with work-people, &c. with water for all purposes, in a situation where none was to be had before, except some bad water from a common pump which has been since removed. But the above supply being more than sufficient, the Machine is occasionally stopped to prevent wear, which is done by merely casting off the string of the bucket-valve."

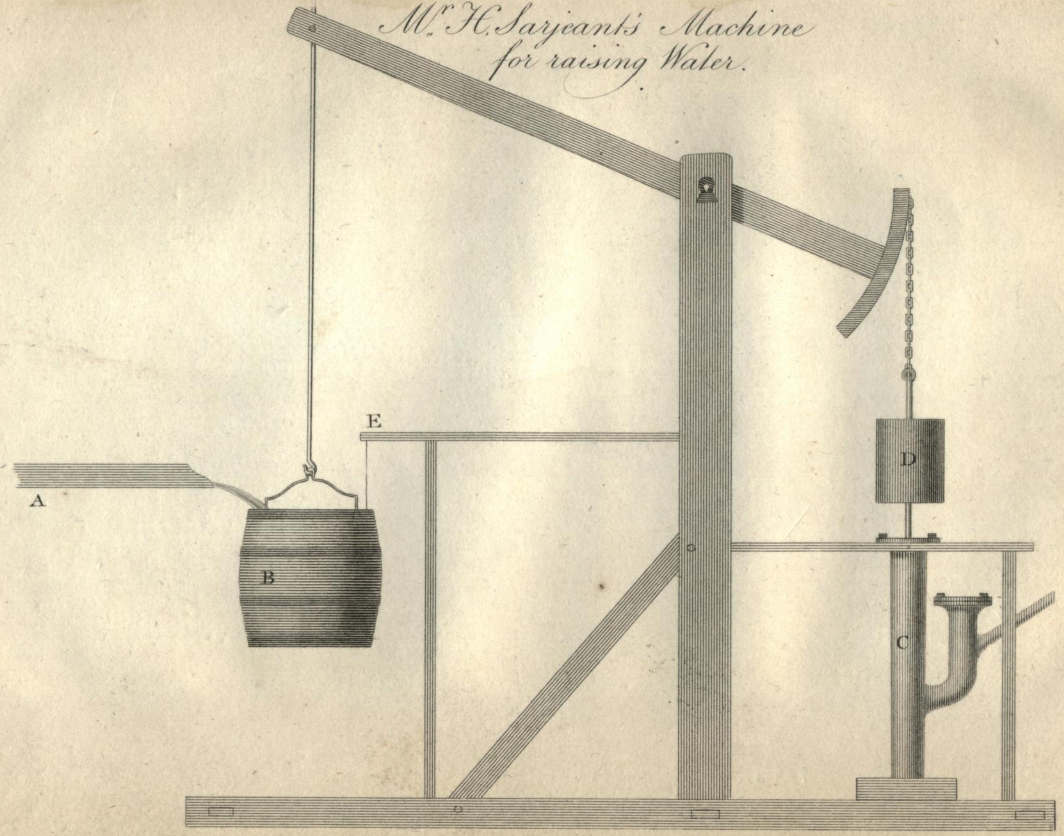
P. S. I have just been informed that a drawing of the Engine, which I had communicated to a person in this neighbourhood, was sent to a Colliery near Swansea some months ago, and that it has already been applied to use there; it is not however sufficiently powerful for the coal-works in this neighbourhood.

The following Certificate accompanied these Letters.

I DO hereby certify, that the Water-Engine constructed near my house, under the direction of Mr. Sarjeant, has been

Pl. 3.

Mr. H. Sarjeant's Machine for raising Water.



Lowry sculpt.

been eight months in use, and fully answers the purpose intended.

EDMUND L. IRTON.

Irton-Hall,
March 18, 1801.

I DO also certify the above to be true.

ROBERT WILKINSON,
One of his Majesty's Justices of the Peace for
the County of Cumberland.

March 13, 1801.

The Sum of TEN GUINEAS, being the Premium offered for taking Whales by the GUN HARPOON, was this Session adjudged to Mr. ROBERT HAYS, Harpooner of the ship Ipswich, fitted out by Mr. T. Wilkinson, of Wapping, from whom the following Account and Certificates were received.

SIR,

I BEG leave to present you with the inclosed Certificate from Captain Robert Kay, commander of my ship Ipswich, employed in the Greenland fisheries, on behalf of Robert Hays, harpooner of the said ship, for the Premium offered by the Society of Arts, &c. for the taking of Whales, he having struck three.

I am, SIR,
Your obedient servant,
T. WILKINSON.

N° 258, *Wapping*,
November 24, 1800.

Mr. CHARLES TAYLOR.

SIR,

BEING, on the 16th of May, 1800, in the latitude of 80° north, and longitude 6° 30′ east from London, I, ROBERT HAYS, harpooner, shot a Whale about ten or eleven fathoms from the boat, which run nine lines out before we got another harpoon fixed in her: it was four hours from the time she was shot until dead. The length of bone was seven feet four inches. Hackluyt's Head-land bearing E. S. E. distant, by estimation, eighteen leagues.

May 26, 1800, being in latitude 79° 40 north, and longitude 7° east from London, I shot a Whale about nine fathoms from the boat, which run eight lines out before fastened by another harpoon. It was two hours from the time she was struck until dead. The length of bone was nine feet six inches.

June 18, 1800, being in latitude 79° 30′ north, and longitude 7° 30′ east, I shot a Whale about eight fathoms distant from the boat, which run eleven lines out before we got another harpoon fixed in her. It was four hours from the time she was shot until dead.

Hackluyt's Head-land bearing E.N.E. distant, by estimation, seven or eight leagues.

The above-mentioned three Whales were struck by me,

Robert Hays.

Witness to the signature,

John Wilkinson.

THIS is to certify the above statement from Robert Hays, harpooner, of the ship Ipswich under my command, is a perfect true and just account; as witness my hand, this 24th of November, 1800.

Robert Kay.

No. 11, *Princes-street,*
Rotherhithe,

The Sum of TEN GUINEAS was this Session adjudged, as a Bounty, to Mrs. J. BESANT, of Brompton, for a new-invented Undershot WATER-WHEEL; from whom the following Account was received, together with Models, upon the new and old construction, for comparative experiments.

SIR,

I BEG leave to lay before the Society some observations respecting the common Undershot Water-wheel, and to point out the superiority of that of my invention.

First,—In common Water-wheels more than half the water passes from the gate through the wheel, without giving it any assistance.

Secondly,—The floats coming out of the tail-water are resisted with almost the whole weight of the atmosphere, at the instant they leave the surface of the water.

Thirdly,—The same quantity of water which passed between the floats at the head, must of course pass between them at the tail, and consequently impede the motion of the wheel.

In the Water-wheel of my invention,

First,—No water can pass but what acts, with all its force, on the extremity of the wheel.

Secondly,—The floats coming out of the water in an oblique direction, prevent the weight of the atmosphere from taking any effect.

Thirdly,—Although the New Water-wheel is heavier than that on the old construction, yet it runs lighter on its axis, the water having a tendency to float it.

Fourthly,—By experiments made with the models, proofs have been shown, that the new Wheel has many advantages over the common wheel, and that, when it works in deep tail water, it will carry weights in proportion of three to one, so that it will be particularly serviceable for tide-mills.

I hope on trial, before the Society, my invention will prove successful, and am,

Sir,

Your obedient servant,

J. Besant.

No. 26, *Brompton.*

To the Secretary of the
Society of Arts, &c.

⁂ Repeated experiments of the above Invention were made by the Committee; from the result of which it appeared to possess some advantages over the common Wheel, and to have a greater power of action.

Description

Description of the late Mr. Besant's Water-wheel. Plate IV. Fig. 1 & 2.

A. The body of the Water-wheel, which is hollow in the form of a drum, and is so constructed as to be proof against the admission of water within it.

B. The axis on which it turns.

C. The float boards, placed on the periphery of the wheel. Each board is obliquely fixed firm to the rim of it, and to the body of the drum.

D. The reservoir, containing the water.

E. The penstock, which regulates the quantity of water running to the wheel.

F. The current of water which has passed the wheel.

Fig. 2. Is a front view of the Water-wheel, shewing the oblique direction in which the float boards C are placed on the face of the wheel.

The GOLD MEDAL, or FORTY GUINEAS, at the option of the Candidate, being the Premium offered for an Improvement in the Method of DRIVING BOLTS INTO SHIPS, was this Session adjudged to Mr. RICHARD PHILLIPS, of Bristol; from whom the following Account and Certificates were received, and who made choice of the Pecuniary Reward. Models of the Machine are placed in the Society's Repository.

MR. RICHARD PHILLIPS, of Bristol, in several letters sent to the Society, states, that he had invented a method of driving Copper Bolts into Ships, without splitting the heads or bending them; and that by means of tubes contrived by him, for the purpose, this could be effected without difficulty, and had been satisfactorily executed in the presence of several of the principal ship-builders of Bristol.

A Certificate accompanied these letters, from Mr. William James, and Mr. Samuel Hast, ship-builders, and also from Mr. George Winter, of Bristol, testifying that they had tried the experiment of driving Copper Bolts through the jointed Cylinder invented by Mr. Phillips; and that they so far approve of it, that they mean to adopt the general use of them, for driving Bolts in all directions, particularly on the outside of Ships, whether iron or copper; as this method not only prevents the Bolts from bending, but keeps the heads from splitting, and enables the Bolts to be driven much tighter, than by any other means with which they were acquainted. They further add, that by the application of Mr. Phillips's Cylinder and Punch, a Copper Bolt which had been crippled at the edge of the hole, and which could not be started by a mall, went up with ease in a perpendicular direction in the flat of a ship's bottom, not four feet from the ground.

This Certificate was witnessed by

MR. WILLIAM HOLDEN.

The same facts are also certified by Mr. Thomas Walker, and Mr. James M. Hillhouse, of Bristol, who add their opinion, that the adoption of this invention, in the different dock-yards of the kingdom, will prove very advantageous.

⁂ Since Mr. Phillips's first application to the Society for a premium, he has made a considerable improvement in the construction of his Tubes. The description and engraving hereunto annexed are of the improved kind: models of both are, however, preserved in the Society's Repository, for public inspection.

The instrument employed for driving the Bolts, consists of a hollow tube formed from separate pieces of cast iron, which are placed upon the heads of each other, and firmly held thereto by iron circles or rings over the joints of the tube. The lowest ring is pointed, to keep the tube steady upon the wood. The Bolt being entered into the end of the hole bored in the wood of the ship, and completely covered by the iron tube, is driven forward within the cylinder by an iron or steel punch, placed against the head of the Bolt, which punch is struck by a mall: and as the bolt goes further into the wood, parts of the tubes are unscrewed and taken off, till the Bolt is driven home into its place up to the head.

The tubes are about five inches in circumference, and will admit a Bolt of seven eighths of an inch in diameter.

Reference to the Engraving of Mr. R. Phillips's Method of driving Bolts into Ships. Plate IV. Fig. 3, 4, 5, 6.

Fig. 3.

A.	The copper bolt, with one end entered into the wood, previous to fixing the tube.
B.	A piece of timber, or ship's side, into which the bolt is intended to be driven.

Fig. 4.

CCCC.	The parts of the iron tube fastened together, ready to be put on the bolt A.
DDDDD.	Iron or brass rings with thumb-screws, placed over the joints of the tube, to hold them firm together.
EEEEE.	The thumb-screws, which keep the rings and tubes firm in their proper places.

F. Two points formed on the lower ring: they are to stick into the timber, and to enable the tube to be held firm in its place.

Fig. 5.

Shows the separation of the parts of the tube which is effected by slackening the thumb-screws and rings.

To put them together, you slide the rings over the joints, placed as close as possible; then, by tightening the thumb-screws, you will have them firm together, and may continue the tubes to any length, from one foot to whatever number is required.

Fig. 6.

GH. Two steel punches or drifts, to be placed on the head of the copper bolt within the tube, whilst driving. The blow given

upon

Mr. Besant's Water Wheel.

Fig. 1.

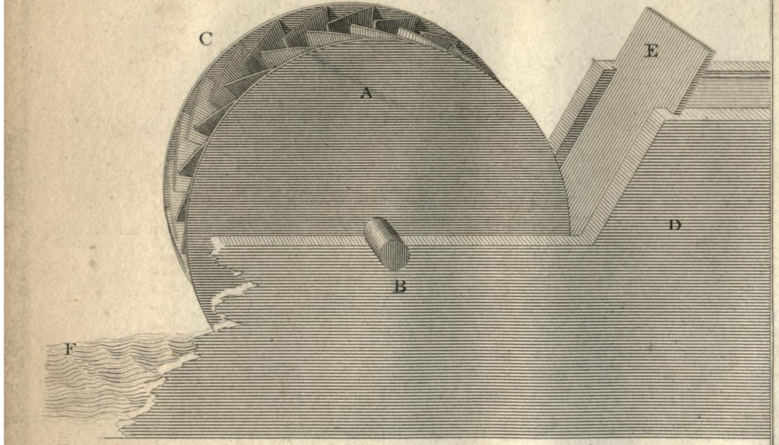
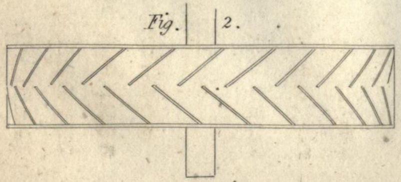


Fig. 2.



Mr. R. Phillips's Tubes for driving Bolts into Ships.

Fig. 3.

Fig. 4.

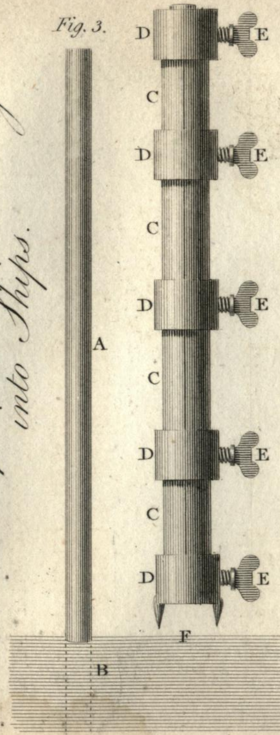


Fig. 5.

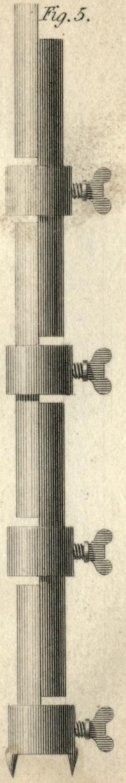


Fig. 6.

Lowry Sculp.

upon the punch drives forward the bolt. The shortest of them should be used first, and, when driven nearly to its head, should be taken out of the tube, and the longer punch applied in its place.

A Bounty of TWENTY-FIVE GUINEAS was this Session voted to Mr. THOMAS ARKWRIGHT, of Kendal, for his Invention of a Machine for RAISING ORE, &c. from Mines; a Plate and Description of which Machine are hereunto annexed, and a complete Model reserved in the Society's Repository, for the inspection and use of the Public.

SIR,

KNOWING that the Society of Arts, &c. always stand forward in support of ingenuity, I take the liberty of sending you the Model of a Machine, for raising Ore from Mines, and likewise for raising Water, by the same operation, if required, which I beg you will present to the Society.

I am, SIR,

Your most obedient servant,

THOMAS ARKWRIGHT.

Kendal, in Westmoreland,
January 22, 1801.

Description

Description of Mr. T. Arkwright's Machine, for raising Ore from Mines. Plate V.

A.	An endless chain formed of thin plates of iron, through the ends of which plates iron bolts are passed, which keep the sides of the chain at a certain distance asunder, and on which the buckets to contain the ore are suspended.
BCDE.	The buckets suspended on the iron bolts.
GHI.	Three cylinders, round which the chain and buckets revolve. The two cylinders GH are placed above the shaft; the cylinder I within the mine. Their rims are so much higher than the body of the cylinders, as to admit the buckets to lie within the rims.

As the endless chain and buckets are moved forwards by a power applied to the axis of the cylinder G, the bolts of the chain fall into notches made at regular distances in the rims of that cylinder, which preserve the chain from slipping.

As each empty bucket passes under the axis of the bottom cylinder I, it loads itself with ore instantaneously from a large box K, constantly filling by the workmen below, which box rests on two moveable pins L, at that end furthest from the wheel, and on an iron catch M at the other. The bucket thus filled ascends to the top of the cylinder G; and, in its passage betwixt the cylinders G and H, discharges its contents into a channel or receiver placed betwixt them, from whence they slide into a cart or receptacle placed underneath the inclined trough N. The empty bucket passes over the cylinder H, descends on the opposite side under the cylinder I, and loads itself again at K, as before mentioned; the buckets regularly loading and discharging themselves, whilst the cylinder G is kept in motion.

Pl. V.

Mr. T. Arkwright's Machine for raising Ore from Mines.

Fig. 1.

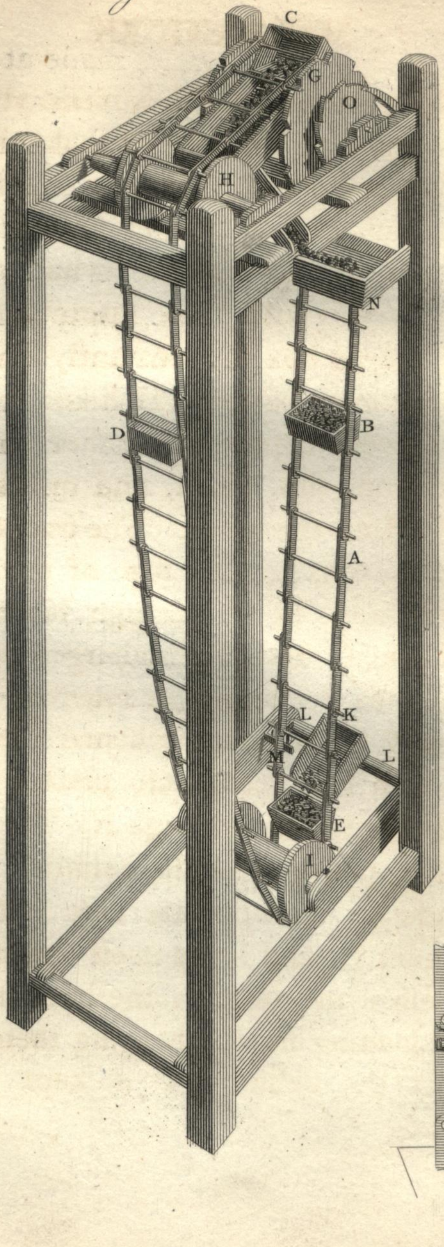
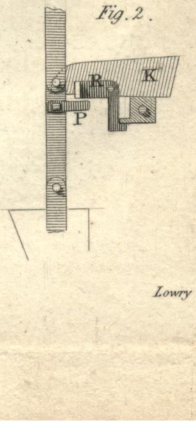


Fig. 2.



Lowry Sculp

O is a racket-wheel on the cylinder, to prevent a retrograde motion in the chain.

Fig. 2. shows, upon a larger scale, the manner in which the box K above mentioned loads the buckets. P is an iron tooth projecting from the endless chain, which, pressing upon the catch R, underneath the box K, occasions that part of the box next the chain to sink down, and discharge into the bucket beneath it a quantity of ore sufficient to fill it. As the loaded bucket rises, it lifts the box K to its former place, till the operation is repeated by the next tooth upon the chain.

⁂ The model remaining with the Society contains two machines put in motion by the same power, one of which is for raising ore, the other for clearing mines from water.. The machine for raising ore was the object for which the Bounty was given; therefore only that part is engraved and described.

The Sum of FIFTY POUNDS was this Session voted, as a Bounty, to Mr. FIELD EVANS, of Pool-Quay, Montgomeryshire, for the Discovery of a Quarry of BURR-STONE proper for Mill-stones, from whom the following Account and Certificates were received, along with a pair of Mill-stones.

SIR,

BEING informed that the Society for the Encouragement of Arts, &c. had offered a Premium to the person who should discover a quarry of stone fit for the purpose of Mill-stones, and of the same quality as French Burr-stones, and having myself discovered such a quarry, in a hill called Moel y Golfa, in the parish of Buttington, in this county, I have accordingly sent a pair of Mill-stones to the Society, before whom I request you to lay my claim as soon as convenient.

I am, Sir,

Your obedient servant,

Field Evans.

Pool-Quay, Montgomeryshire,
10*th May,* 1800.

Mr. Charles Taylor.

The following Certificates accompanied this letter, viz. from Mr. Henry Gardner, mill-stone manufacturer, Liverpool, dated the 1st of March last, stating, that he had manufactured into mill-stones several tons of the Moel-y-Golfa-Hill Burr-stones, and believes them to be a good substitute for French Burr.

From Elisha Williams, dated the 29th of April last, of the parish of Erbistock, in the county of Denbigh, stating, that he had used a pair of Burr mill-stones from Moel-y-Golfa quarry in Montgomeryshire, which he had found equal to the French Burr mill-stones, and that they would with ease grind eight measures in one hour.

From John Allport, steward to the Montgomery and Pool House of Industry, dated the 30th of April last, stating, that he had used at the Gaer-mills near Montgomery, one pair of Mill-stones from Moel-y-Golfa quarry, and that he finds them equal to the French Burr mill-stones. The above is also attested by Amb. Gettyn, and Morris Jones, Directors of the Corporation of Guardians of the Poor of the Montgomery and Pool united district, and W. Williams, miller.

From Lewis Evans, Esq. of Esgair-giliog, in the county of Montgomery, stating, that he had used a pair of Mill-stones from the Moel-y-Golfa quarry, for grinding wheat, and found them equal to the French Burrs. The said Certicate is attested by Hugh Evans, Esq. and Robert Jones, miller, on the 2d of May last.

From W. Heighway, dated Pontesford the 6th of May, 1800, stating, that he had used two pair of Mill-stones at his mills, in the county of Salop, for grinding wheat; that they came from Moel-y-Golfa quarry; and that he found them equal to the French Burrs.

From John Davies, New Mills, dated the 7th of May last, stating that the Mill-stones usually obtained on the Moel-y-Golfa Hills answer very well, and that he had used them himself.

In a letter dated the 5th of March last, Mr. Field Evans states, that the specimens of Stone which he has sent may not probably appear so porous as the French

Burrs, the pores being in a great measure filled with a soft chalky substance, which, when worked, clears out, and is not found to injure the flour; and that the stones become harder in using. That the quarry lies in the south-west end of the hill, about 300 yards from the foot or bottom of it, the vein being in some parts three yards wide, in others not more than four feet; that it makes its appearance on the surface from south-west to north-east, from 400 to 600 yards, and then disappears on the surface for about a mile north-east, where the vein is much wider than before mentioned; that the quarry has been worked from fifteen to twenty feet deep, without any appearance of a bottom; and that there is likewise a great quantity of Burrs promiscuously in the soil, which are of a good quality, particularly on the east side.

Mr. Field Evans also, in the above-mentioned letter, furnishes a particular account how he discovered the said Burr-stones, in October 1797; that he noticed them in about two months afterwards to Robert Lambert, a mill-wright; and that, about June 1798, he employed Thomas Webster to make him a pair of Mill-stones from the said Burrs. He further observes, that the said Mill-stones have been almost in constant use, at Mr. Evans's mill, for about two years and a half; that he has since kept from one to three persons constantly employed in making Mill-stones from the said quarry, who have made above twenty pairs; and that he has sold fourteen pair and a half thereof, and fifty-seven ton of the stone, and has not heard any complaints respecting their quality.

A certificate, dated the 4th of March, 1801, from the Rev. William Davies, of Buttington, and Richard Williams, and Thomas Brown, churchwardens, testified that Mr. Field Evans was the first person that discovered the quarry in Moel-y-golfa Hill, and applied the Burrs to the making of Mill-stones.

Mr. J. Probert of Powis Castle, in a note, dated the 5th of March, 1801, states, that the mountain which produces these Mill-stones, is situated on the western confines of the county of Montgomery, bordering upon Shropshire, about a mile and a half distant from the river Severn, by means whereof they may be sent to Bristol, as well as to the interior parts of the kingdom, along the canal joining the Severn with the Thames; that the Montgomeryshire Canal branches out of that of Ellesmere, along which they may be conveyed to Chester, Liverpool, &c.

The Silver Medal was this Session adjudged to Mr. Garnet Terry, of the City-Road, Finsbury-Square, for an improved Mill for Grinding hard Substances; a Plate and Description of which are annexed, and a complete Model reserved in the Society's Repository.

SIR,

I HAVE taken the liberty of sending, for the inspection of the Society for the Encouragement of Arts, &c. a small Mill calculated for the purpose of grinding hard Substances.

I have made one on a large scale, and find it answers the purpose of reducing to powder, Coffee, Bones, Ashes, and other such things: it has also been tried, and found effectual and expeditious, in breaking down Beans, Peas, Malt, Barley, &c. If it is worth the notice of the

Public, I beg you will make such use of it as the Society may think proper.

I am, with respect,
SIR,
Your humble servant,
GARNET TERRY.

N° 20, *City Road, Finsbury-square,*
March 3, 1801.

Mr. CHARLES TAYLOR.

Description of Mr. Garnet Terry's Mill. Plate VI. Fig. 1.

A. The hopper, or receptacle of the articles which are intended to be ground.

B. A spiral wire, in the form of a reversed cone, to regulate the delivery of them.

C. An inclined iron plate, hung upon a pin on its higher end: the lower end rests on the grooved axis D, and agitates the wire B.

D. The grooved axis, or grinding cylinder, which acts against the channelled iron plate E.

F. A screw on the side of the mill, by means of which the iron plate E is brought nearer to or removed further from the axis D, according as the article is wanted finer or coarser.

G. The handle, by which motion is given to the axis.

H. The tube from whence the articles, when ground, are received.

⁂ The front of the mill is taken off, in order to show its interior construction.

A Bounty of FIFTEEN GUINEAS was this Session voted to Mr. WILLIAM BULLOCK, of Portland-street, for an improved DRAWBACK LOCK for House-Doors; a Plate and Description of which are hereunto annexed, and a complete Lock reserved in the Society's Repository.

SIR,

I HAVE herewith sent, for the inspection of the Society, an improved Drawback Lock for House Doors, &c. which improvement is in latching the door; for it is well known, particularly in damp weather, that the air drawing through it, rusts the head or bevel of the bolt, by which means it requires great force to shut the door, and occasions a disagreeable noise, besides shaking the building.

It has frequently happened that the house has been exposed to robbery from the door being left unlatched, when supposed to be fast. This improvement removes all those inconveniences, as it lets the bolt shoot into the staple immediately when the door closes, but not before; and the reliever works so very easy, that the door is made fast with one twenty-fourth part of the force required with locks upon the common construction.

By an experiment with the Lock sent herewith, it will be proved that two ounces added to the reliever, will shoot the Lock with more ease than three pounds will do, applied to the bevel bolt; and if the lock is rusty, the advantage will be much more in favour of the new method. I flatter myself it will be of great utility to the public, as its construction is simple and cheap. It may be added to any old lock, as may be seen from that now sent. It may be advantageously applied to French windows and glass doors, as it prevents the door from being strained, or the glass broke, by the force applied to shut them. I have fixed several Locks, upon this new principle, which answer well; and if the invention meets with the approbation of the Society, I hope to be rewarded according to its merit.

I remain, with respect,

SIR,

Your most obedient servant,

WILLIAM BULLOCK.

N° 6, *Portland-street, Soho,*
May 5, 1801.

Mr. CHARLES TAYLOR.

Mr. Garnet Terry's Mill.

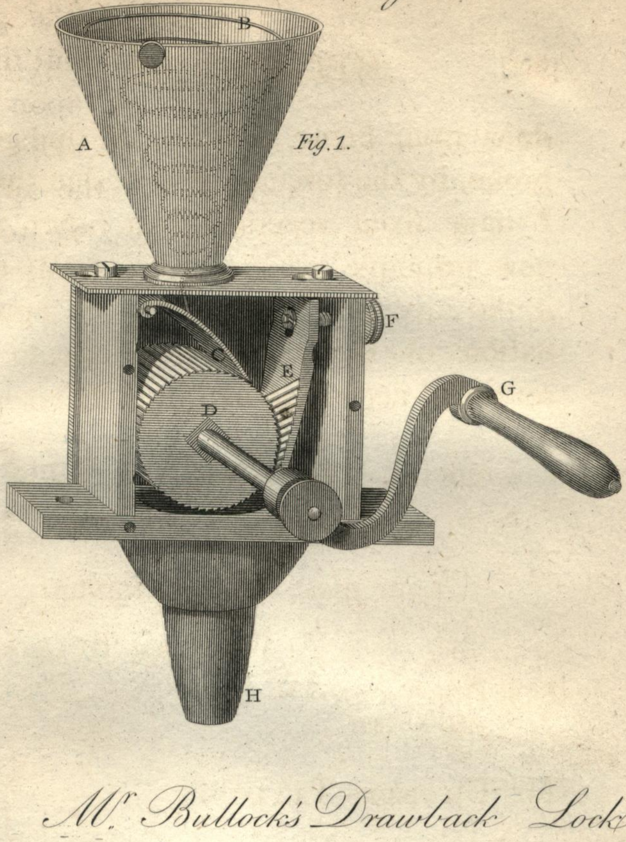


Fig. 1.

Mr. Bullock's Drawback Lock.

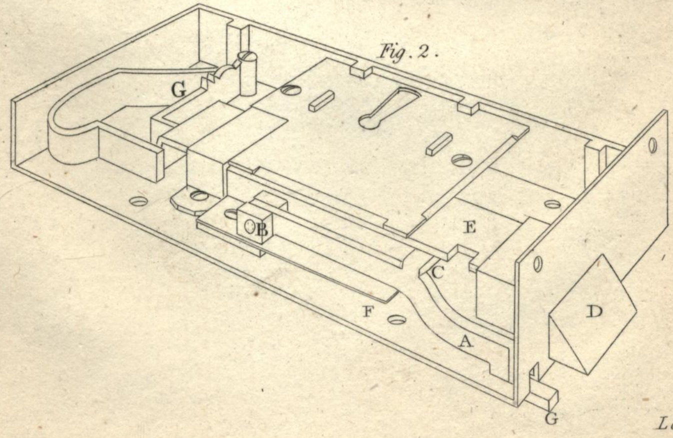


Fig. 2.

Lowry Sculp.

Description of Mr. William Bullock's improved Drawback Lock. Plate VI. Fig. 2.

A. Is the new iron latch here affixed to an old common drawback house lock.

B. An iron pin at one end of the latch, on which pin it is moveable.

C. A projecting part of the latch, which, when the common spring bolt D of the lock is drawn back, in the usual manner, is forced into the nick on its higher part at E, by the spring F, underneath the latch.

The bolt D then remains within the lock, until, on closing the door, the reliever G gently presses on the lock box, fixed in the common way on the door cheek; which pressure draws the projecting part C out of the nick E, and permits the end of the bolt D, by the force of the spring G, to slide into the lock box, and fasten the door.

The Sum of FIFTEEN GUINEAS was this Session voted as a Bounty to Mr. THOMAS GENT, of Homerton, for a new-invented CRANE, for raising and delivering heavy Bodies. A Plate and Description are annexed, and a Model of the Machine may be seen in the Society's Repository.

SIR,

AN offer of encouragement being published by the Society, to any person producing a model of an improved Machine for drawing up Ore, &c. from mines and pits; I beg leave to submit to your consideration a model of a Crane, which I hope will answer for that purpose; also for sinking Wells, clearing Canals, and raising Casks or other heavy Weights out of Cellars. I flatter myself that a Machine on the principle of this model, is calculated better for this purpose than any I have seen, it having a two-fold principle, viz. first, that of making a perpendicular draft, and discharging the load at the same time (without any intermediate space); and, secondly, raising the same a sufficient height, so as to place the article in a cart, or other carriage, for conveyance. I leave the merit of the plan to the judgment of the Society, and shall be pleased with such encouragement as they may award.

I am, Sir,
Your obedient humble servant,
Thomas Gent.

N° 5, *Lower Terrace, Homerton,*
April 14, 1801.

Mr. Charles Taylor.

Description of Mr. Thomas Gent's Crane. Plate VII. Fig. 1 and 2.

A. The crane, three feet in length from the centre B.

B. The centre, upon which it turns under the cross-beam.

C. The quadrant, two feet eight inches in length from the centre B.

D, A chain, which works upon the quadrant, and communicates with the roller E, on which is a toothed wheel put in motion by a small pinion on the axis of the winch-handle F.

G. A rope, which passes over the pulley H at the end of the crane. The weight to be raised is fastened to the block I, and is lifted up by the other end of the rope winding round the roller K.

K.	Is a roller, on which a toothed wheel is placed, and worked by a pinion fixed on the axis L, moved by the handle M.
NN.	Are catches, which are slided occasionally into the teeth of the wheels on the rollers, to keep them stationary.
O.	The cross-beam of the machine, from which the crane is suspended underneath.
PP.	Two upright posts, which support the cross-beam.

When a weight is to be lifted from within the shaft of a mine, over which the machine is to be placed, the pulley H should be drawn down, and the point of the quadrant C raised upright in a perpendicular line; then, by working the handle M, the weight is raised from within the shaft, until it clears the surface of the ground, at which period, by turning the handle F, the point of the quadrant C is brought gradually into an horizontal line, which projects the crane and weight so far from the shaft, as to allow a cart to be placed underneath to convey the article which has been thus raised.

Fig. 2. shews the method by which the chain is connected with the roller.

D. The same chain as in the former figure, but in a different point of view.

E. The roller mentioned in the former figure.

SS. A double cord, the two extremities of which are fastened at TV to the roller E, and joined to the lower end of the chain at W: this double cord serves to keep the chain regularly in the centre of the quadrant.

Pl. VII

M^{r}. Tho^{s}. Gent's Crane.

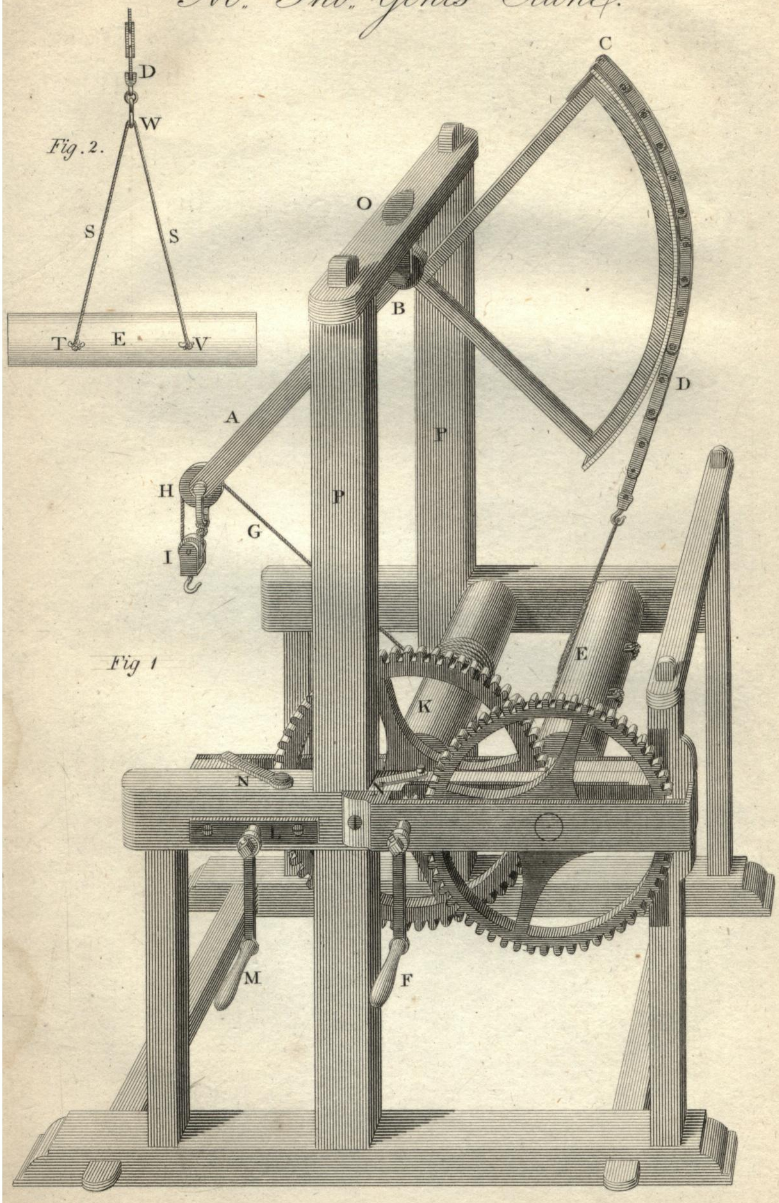


Fig. 2.

Fig 1

Lowry Sculp.

The Thanks of the Society were this Session voted to SIR GEORGE ONESIPHORUS PAUL, Baronet, of Grosvenor-Street, for the following valuable Communication of the method invented by him, and used under his direction, for the VENTILATION OF HOSPITALS, &c. Actuated by his usual philanthropy, he has also presented to the Society Models of the Machinery he employed, and which are reserved in the Society's Repository, for public inspection. Engravings and a Description of them are hereunto annexed.

SIR,

I HAVE been favoured with your letter, stating the terms of a Premium offered by the Society of Arts, &c. for "A Mode of permanently ventilating the Apartments in Hospitals, Gaols, and other crowded places, superior to any now known or used;" and that the Society had done me the honour "to direct you to express their wish to receive from me communications on this subject."

I not only agree with the Society, that "the subject is important to the health of persons destined to inhabit such places" as are specifically mentioned in the proposal for the Premium; but I also believe that the morbid effects of impure air are felt in all situations of life where education, business, or social intercourse, may aggregate mankind.

From observations made during a pursuit which of late years may be said to be habitual to me, I fear I must *also* admit that Ventilation is improperly performed, by the means now generally employed,—where those means act on persons in a sickly or convalescent state, or accustomed to delicate habits of life.

The transverse passage of outward air, through a room (which I shall term free Ventilation), is no *doubtful* mode of obtaining vital air; yet, certainly, if the attendant consequences render such a mode inadmissible (to an efficient degree) in the abodes of sickness or infirmity, the Society are justified in considering the subject as open to much further improvement.

Desiring to be understood as not addressing the Society as a claimant of their Premium; I conceive I may assist them in the pursuit of their laudable purpose, by submitting to their perusal some practical observations on the modes of Ventilation hitherto practised, and by communicating the outline of a design already conceived, and in a limited degree adopted, for correcting their admitted imperfections.

It may be necessary to premise, that the peculiar enquiry, the result of which will be detailed in the following pages, was excited by some objections, originating in a most respectable quarter, and directed against a system, on which I had heretofore *solely* depended, in providing for the Ventilation of such public establishments as have been placed more particularly under my direction.

It may be inferred from the note annexed to the proposed Premium, that similar objections are entertained by the Society: I shall therefore, as you requested, submit my observations, without that delay which would necessarily be occasioned by my modelling them in conformity to the rules you have communicated, and waiting for certificates to accompany them. If there really does not exist a doubt as to principle or fact, on a question so important, should not that doubt be made the subject of a previous special consideration, so that a point of direction may be given to the mechanical exertions intended to be excited?

Although particular conclusions may be controverted, I may venture to assume as the basis of all observations on this subject,

First,—That a certain and frequently renewed supply of vital air is essential to the purposes of animal life; and the more regular and uninterrupted that supply, the more favourable will it be to health.

Secondly,—That where the quantity of atmospheric air introduced into an apartment, is less than nature has bestowed in free circulation, her purpose is in a degree counteracted; and although the breathing impure air (*i. e.* air despoiled of its natural proportion of vital air) for a short time may not produce an immediate sensible effect, an injury may arise to the constitution, proportionate to the extent of that time. And further, when (as in the ordinary intercourses of society in London) persons are in the habit of placing themselves, during a considerable portion of every twenty-four hours, in a situation to breathe in this defective atmosphere, the accumulated consequences may be serious and important.

Thirdly,—That in rooms from which currents of fresh air may not be excluded, they may be so injudiciously directed as to be useless and injurious. And,

Fourthly,—That if, in addition to the consumption of vital air by the lungs, the persons of those assembled in any apartment should be filthy,—should their clothing (particularly that made of woollen) have been so long worn as to have absorbed any considerable portion of the perspiration of the body,—or should the apartment itself be damp and foul, the vital properties of the air will be contaminated, and although instant death may not ensue (which has been known to be a consequence), the fevers emphatically termed the Gaol, Hospital, or Ship Fever, from its usually originating in these places, will be generated with a degree of malignancy proportionate to its causes, and, being so generated, will become infectious with a like degree of malignancy.

It is about twenty years since the deleterious consequences of inattention to Ventilation were set forth by Mr. Howard. So strong and so general was the conviction of the public mind, not only as to the evil pointed out, but regarding the remedies proposed by that indefatigable philanthropist, that the Legislature thought fit to adopt the whole of his principles, and to make them the basis of several positive laws, under the direction of which the greater number of prisons of the kingdom have since been reconstructed, and the remainder (with few exceptions) altered in conformity to the principle recommended by him, namely, *that of introducing cur-*

rents of fresh air INTO *and* THROUGH *every apartment.*

In these prisons, where attention is also paid to personal cleanliness, I venture to say, the Gaol Fever is unknown, unless brought into them by prisoners committed in a state of previous infection.

By equal exertion on the like principles, the healthiness of the ships of war has been so improved, that they are no longer sources of this desolating pestilence.

Regarding hospitals, I fear it cannot be proved that a relief so complete has been effected. Mr. Howard was not sparing in his strictures on the management of this important branch of our public institutions; but the improvement he suggested went no farther than simply the introduction of fresh air. The reconciling this advantage with that generally diffused warmth, necessary in ſick rooms, ſeems to have eſcaped his contemplation.

Of the ſeveral hoſpitals conſtructed ſince his obſervations were made public, moſt have been planned with a view to facilitate the paſſage of outward air through the wards. The Directors of old hoſpitals have adopted alterations more or leſs tending to the ſame purpoſe; but all ſeem to have reſted at this point: yet, conſidering the importance of pure air to patients, during the tedious cure of compound fractures, and other accidents or diſeaſes, together with the no leſs important object of ſecuring them from currents of cold air, it cannot be denied that much ſtill remains to be effected.

In the conſtruction of the larger Workhouſes, termed Hundred-houſes, ſimilar principles of Ventilation have been attended to with evident ſucceſs, in preſerving the health of the inhabitants; but with reſpect to Pariſh Workhouſes on the *lesser* scale—School-rooms (both for boys and girls in every rank of life), Manufactories—Apartments for Public Lectures—and Ladies Assembly-rooms—these, together with the circumscribed Cottages of the Poor, remain in a state most dangerous to health from imperfect Ventilation. To these sources, and to no other, may be traced the few putrid and contagious diseases which occasionally show themselves amongst us; and which, to the credit of *free Ventilation*, can no longer justly be called Gaol or Ship Fever.

At a period of demonstrated success of the doctrine recommended by Mr. Howard, and adopted by his disciples, the valuable essays and experiments of Count Rumford appeared before the public: whilst opening to the world a new and most useful system of domestic philosophy, he has advanced opinions unfavourable to those means by which these important effects have been produced.

In theory this ingenious philosopher and friend of mankind has decidedly negatived the necessity and questioned the propriety of Ventilation, by the admission of currents of air. In the construction of those buildings most immediately under his direction, he has certainly adopted a *practice* of a direct opposite tendency.

Opinions of such authority could not fail to be respected: they must at least raise a doubt in the mind of the most confident advocate of an opposite theory.

As the Count's observations and practice tended to invalidate a material part of that system, in the pursuit of which immense sums had been *confidently* expended in the kingdom, and respecting which I bear more than a common share of responsibility, I felt myself peculiarly called upon to scrutinize his objections, and to obviate such as should appear to be denied by experience; but, at the same time, certainly to abandon whatever ground could not be fairly maintained by a result.

As my conclusions on the point disputed are formed on circumstantial observations made within a Prison and Hospital immediately under my own eye, and as these particular institutions have not unfrequently been resorted to as examples for imitation, a detailed reasoning regarding them may serve for general application.

The County Gaol at Gloucester is constructed on the principles of admitting air to pass into and through it in strait lines, from one extremity to the other. There is no obstruction to a freedom of current, other than as the streams of air passing through the long passages, open at each end, move with the greater velocity, they of necessity carry with them the weaker currents, passing into and through the cells at right angles.

From the time this prison was opened in 1791, until the year 1800, about 1300 persons were committed to it; and, on the average, about one hundred prisoners were constantly confined in it. In these nine years the number of deaths has been thirteen; and of these, four sunk under the effects of disease brought into prisons with them. During the last year, the prison has been crowded in an uncommon and very improper degree: two hundred and fourteen have been confined; and the average number has been one hundred and sixty-seven. One prisoner only has died (a woman aged sixty) in the month of October last. At the opening of the Spring Assizes, 1801, (the time of the greatest numbers) there was not one prisoner sick, or in the hospital ward.

By this statement it appears, that the proportion of deaths is so much below the common average, in the ordinary situations of life, that the healthiness of this abode may be said to be peculiar; and it is in proof, that however currents of air may be found injurious to particular constitutions, they are not unfavourable to general health.

Every prisoner in this gaol, when not in the infirmary-ward, sleeps in a room containing from fifty-two to fifty-seven feet of superficial space, built with brick, resting on an arch, and arched over; so that no air can enter it but through the openness provided for it. As air is constantly passing immediately under it, and round it on every side, it is necessarily dry: it is ventilated by opposite openings near the crown of the arch. To that opening which is towards the outward air, there is a shutter, which the occupant may close at will; but it is so imperfectly fitted, that, when closed, a considerable portion of air must enter by its sides. The opposite opening to the passage, the prisoner has no means of closing in any degree.

During the ten years these rooms have been inhabited, there have been three winters in which the cold has been intense. As I had considerable apprehensions of the effects of this situation in severe weather, I directed the surgeon of the gaol to be constant in his attention; and particularly in the report of his observations during the inclemency of these seasons. I also made a point frequently to visit the prison, and to examine every prisoner as to the effects apprehended; and, as much to my surprise as to my satisfaction, notwithstanding the querulous disposition of persons in their situation, I never heard a complaint from old or young, from male or female, suffering by cold in the night apartments.* And further, it is the decided opinion of the two able physicians who have most liberally undertaken to superintend the health of this prison, that no ill consequences have arisen from prisoners sleeping in the situation above described.

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* Fahrenheit's thermometer has never been observed to be below 33° in the severest nights, in the middle region of a cell in which a prisoner was sleeping; whereas, in the ordinary apartments of a dwelling-house, water is frequently known to freeze by a bed-side.

I must contend, therefore, it is a fact established by experience, that in a room containing not more than from 415 to 439 cubical feet of air, in which there is no fire, the body of a person sleeping under a proper allowance of woollen bed-clothes will so far warm the atmosphere around him, or to speak more conformable to modern doctrine, so little of the heat generated in the body will be carried off by the surrounding air, that he will not suffer by a current* passing at a distance over him, provided the apartment be secured from damp.

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* The term "current" is not to be understood in a stronger sense than merely to signify that species of circulation of air, which is directed in strait lines from point to point, by the action of any efficient cause.

On the points, therefore, of warmth and Ventilation *combined* it must surely be allowed (regarding rooms so constructed) there is no farther *desideratum*.

Prisoners, on their rising in the morning, are removed into small working-rooms or wards situated on the ground-floor. These day apartments are, in like manner, constructed with cross openings near the ceiling or crown of the arch; but there is also in each of them an open fire-place. Respecting these apartments, my observations tend to *confirm* Count Rumford's objection to open fires, and his preference to closed stoves. Nay, farther, I am disposed to admit, that openings for free Ventilation are incompatible with strong fires in open fire-places.

It is certain that, in rooms so provided, the danger arising from impure air is completely guarded against; yet this advantage is gained at the risk of another evil, which, though not so important, should, if possible, be avoided.

The air which in the same room without an open fire-place would pass inwards by one opening, and outwards by the other, being attracted by the fire to supply the constant rarefaction in the chimney, passes inwards from both openings towards the fire place, and the body of a person placed near it, being in its current, is exposed to the danger of partial chill. To this circumstance, in these apartments, I am inclined to attribute the few complaints of a dysentery or aguish tendency, which have occasionally interrupted the general health of this prison.

In the hospital, the scene of my observations, the morbid effects of foul air in the wards have, until lately, been no otherwise relieved than,

First,—By introducing currents of fresh air by the windows, with an improved

proved mode of hanging the upper sash, peculiar to this hospital, by the effect of which the current of air admitted is turned upwards to the ceiling, and prevented from descending on the patients, whose beds are placed under the windows;

Secondly,—By piercing holes in the ceiling of the wards, and by means of plaistered channels or wood funnels, leading the foul air, rising into them, to the roof.

In warm weather, when the doors of the wards are open, and the fires low, these channels or funnels operate with considerable effect. Much foul air will by its relative specific lightness (not being counteracted by a stronger power), ascend them and escape; a further portion will pass off by the windows opening to the leeward, and Ventilation may be duly effected.

But, on the contrary, when the doors are shut, and strong fires are made, these will inevitably attract the currents of air *inwards* and towards them, from all the openings; and should patients be situated in their course, the effect cannot fail to be injurious.

Besides, as the windows are generally closed in the night (the most important time for Ventilation), no other change of air takes place, but what is effected by the open fires, which, whilst supplied immediately from the middle region, are constantly consuming the best air of the room.

Hence it appears that free Ventilation, or the transverse passage of outward air, may be inconsistent with the general warmth required in the apartments of the sick; and that channels for the escape of foul air, unassisted by a power more constant and decisive than the relative specific lightness of that air, is a mean inefficient to preserving a healthful respiration in the crowded wards of an hospital.

As a remedy to these apparent defects in the ordinary mode of Ventilation, it has been imagined that the draft, or determination of the air, to the funnels in the ceiling of the rooms requiring Ventilation, is accelerated by the operation of fire; and by causing an increased degree of rarefaction, at the termination of the funnel, to discharge the air rising to the ceiling in a degree depending on the correct application of the apparatus and quantity of fuel consumed.

In all rooms or apartments requiring Ventilation, it is presumed that (according to the old system) channels or funnels are provided for the discharge of air ascending into them. These channels or funnels, so provided, should be rendered air-tight, and brought to terminate immediately under the fire intended to work them. The ash-pit and fire-place should be so closed, by doors, as to prevent the fire from drawing the air from the room surrounding it. The whole draft or consumption occasioned by the fire will then be supplied from the further termination of the channel or funnel.

This effect may be applied according to circumstances, either to the ceiling of the room in which the fire is made, to the room below, or to that above it; and draught thus produced may, by a proper apparatus, be increased or diminished at will.

In the hospital in which I have made the first experiment of this design, I have caused a stove to be so formed as to answer the culinary purposes of the ward in which it is fixed, and at the same time to ventilate the ward beneath it; and no additional expense is created in fuel by the operation.

By a fire made in one of these stoves, a ward beneath it, containing about 18,000 cubical feet, filled with patients (and which, in spite of all former means, was ever remarkably offensive) was in a few minutes so relieved of contaminated air, as to be sensibly felt by all the patients in it, without their perceiving any increased current.

The principle of the means of Ventilation adopted in this hospital may be be applied with perfect facility to ships.

By carrying the funnel from a cabin or ship stove, of any kind or dimension (observing *only* to exclude the admission of surrounding air), to the hold or underdecks, they may be as completely ventilated as the wards of an infirmary. In stormy weather, when the decks of a ship must of necessity be closed, the fires would perform a service which could no otherwise be attained; whilst, by the nature of the apparatus, the fire itself would be secured from the effects of the wind.

If the stove or grate over a lady's drawing-room were properly fitted to this purpose, on the evening of her assembly, it might be set in action, and the room beneath cleared of its impure air, without recourse being had to the openings of windows: the openings in the ceiling might be rendered ornamental.

By applying the same principle to German or other closed stoves, the chief objection to their use in crowded rooms would be obviated; and I should then agree with Count Rumford, that in all rooms, where the indulgence of the habit of open fires was not in question, such stoves (if constructed of earthen materials) would afford a more " genial warmth," and a " due circulation be at the same time effected."

So fitted and constructed, they would be incontestably better than open fires for the wards of Hospitals, Poor-houses, Manufactories, Theatres for Lectures, School-rooms, and Prisons. Respecting the last-mentioned structures, I must further observe, that if public Kitchens

were

a sutler appointed, under due regulations, the present necessity of open fires for prisoners to cook individually for themselves, would be superseded much to their advantage.

On the other hand, I must also observe, that if closed stoves, acting on this principle, were adopted, Count Rumford's objections to the introduction of fresh air would be obviated, with regard to any room in which they should be in action, provided the opening through which it entered was made on a level with the ceiling.

Air entering at this level would, in the absence of open fires, be acted upon by no other draft than the mouth of the funnel in the ceiling, and could not descend in currents to the lower region of the room.

In a room so filled with company as to vitiate the air within it, the atmospheric air entering, being specifically heavier, would indeed descend, and be replaced by the ascending impure air; but, as it would not descend by a stronger impulse than its difference of specific weight, it must be slow in its motion, and would produce no sensible current.

Should the above observations and conclusions be thought worthy attention, I shall, with great pleasure, direct Models of the improved Hospital-Sashes, and of the Stoves for accelerating Ventilation by the action of fire, to be made for the use of the Society.

I am,
Your very obedient servant,
G. O. PAUL.

Grosvenor-Street,
May 30, 1801.

CHARLES TAYLOR, Esq.
Secretary to the Society of Arts, &c. *Adelphi.*

A perspective View of Sir G. O. Paul's Stove, for ventilating the Wards of Hospitals.

Plate VIII. Fig. 1.

A A.	A chimney-piece, of ordinary dimensions.
B.	A Bath-stove, made to fit the chimney: the hobbs of which, NN, project two inches and a half before the fire-grate.
C C.	Folding-doors to close the fronts of the ash-pit, and to fall back against the hobbs.
DD.	Folding-doors to close the front of the fire-grate, and to fall back against the hobbs.
E.	A door to close the top of the fire-grate, when a very strong draught is required. When put down, the smoke is directed through the open space H, and the door is used as a hot table for

culinary purposes; when open, it serves as a chimney back.

F. A flat bar projecting two inches and a half before the fire-grate as a stop to the upper and lower doors.

G G. Holes left in the castings of the ash-pit, to receive the mouths of air-tunnels in the back, or on either side, as circumstances may require.

H. The opening to the back flue, used as a passage for the smoke, when the top door is closed on the fire-grate.

I I. A double register:—first, to close the back flue when the fire-grate is open; secondly, to close the front flue when the back draught is necessary; and, thirdly, to prevent the heat being carried up the chimney.

Fig. 2. A back view of the ventilating stove, on which similar letters are marked as denote the same parts already mentioned in *Fig.* 1.

K K. Are shoulders for tunnels cast with the ash-pit, fixed at the openings G G, mentioned in *Fig.* 1.

N. B. There should be doors or regulators to the mouths of the air-tunnels K K, to close them when the doors of the stove are open, otherwise (there being at that time little or no draught by the tunnels towards the fire), the dust will pass by them into the rooms with which they communicate.

L L. Air-tunnels are to be fixed on the shoulders K K, and to be prolonged in any direction required, either downwards to any room below, which wants ventilating, or upwards to the ceiling of the room in which the fire is made, or to any rooms above it requiring ventilation.

N. B. The direction of the first length or piece of the tunnel should, in all cases, be upwards, to prevent sparks of fire, which may fly into it, being conveyed into a room ventilated by a descending tunnel.

The tunnel should, at least, rise so far that the lower edge of it may be higher than the upper edge of the shoulder on which it is fixed.

M. A back flue to conduct the smoke when all the doors are closed, and the stove made to act with its utmost force.

NN. The hobbs on each side the fireplace.

Fig. 3. A side view of the ventilating stove, in which the letters correspond as before.

Fig. 4. A view from above of the two chimneys which convey away the smoke, and of the register which closes one or other of them, as occasion may require.

Description of the Sash-Window for an Hospital. Plate VIII. Fig. 5.

aaaa. A common sash-window frame, the upper extremity of which should be level with the ceiling of the room.

b. The lower sash fixed.

c. The upper sash working inwards on the pivots *e e*, at each side of its lower end.

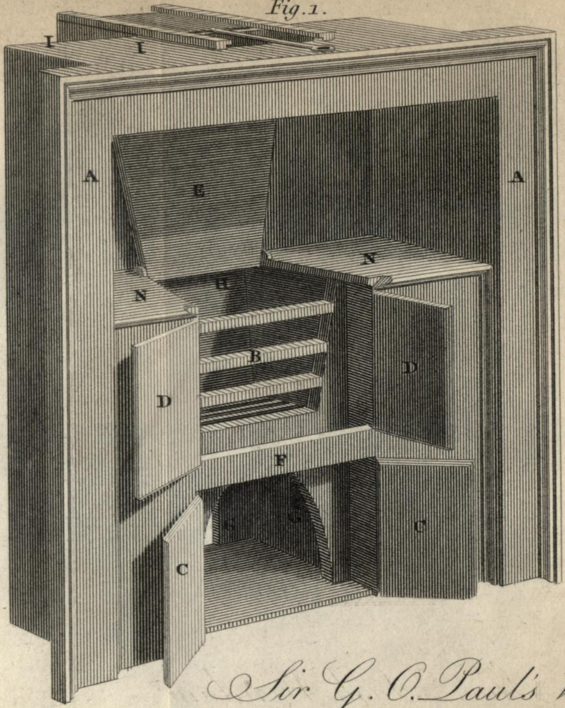
dd. Inclined edges fixed, with a proper inclination inwards, on the jambs to which the sash is fitted. These jambs and ledges should be made as exactly as possible to fit the sash in its working, to prevent air from passing inwards by its sides.

e e. The pivots on which the upper sash-frames move.

f. A regulator, notched on its lower part, and moving in a groove *g*. At the extremity of the regulator is a loop or ring *h*, to receive a hook fixed to a long pole, by which the sash may be worked by the apothecary or nurse. The notches in the regulator resting on the groove, admit the sash to be placed at any intermediate distance required.

The pole may be afterwards removed out of the reach of the patients.

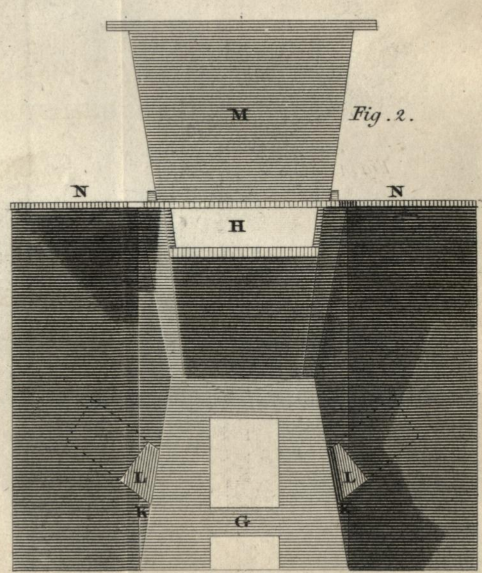
Fig. 1.



Sir G. O. Paul's Ventilating Stove

Fig. 3.

Fig. 2.



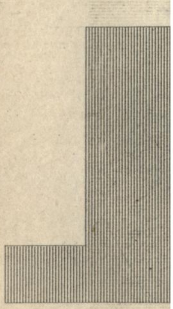


Fig. 3.

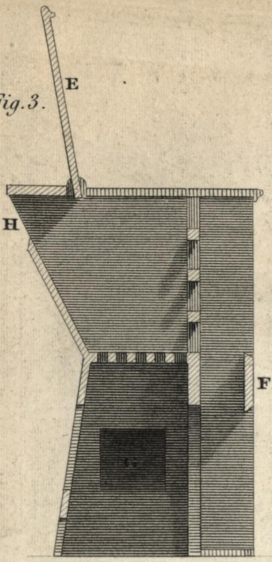
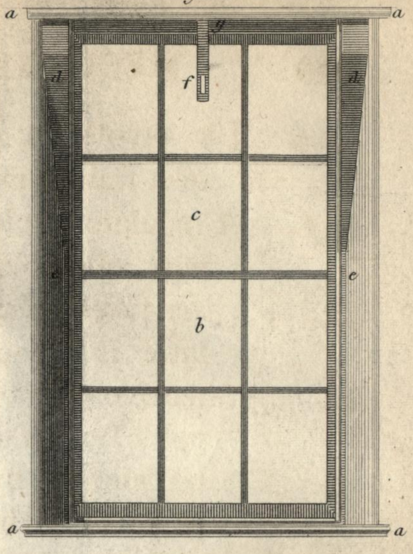


Fig. 5.



ting Stove & Sash Window for Hospitals.

Fig. 4.

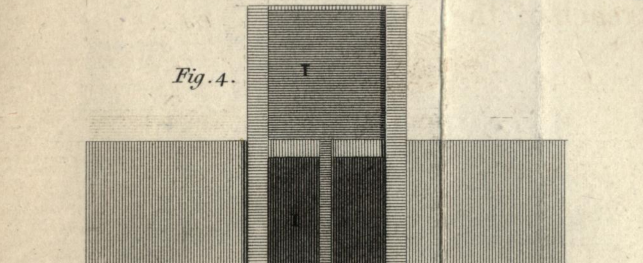
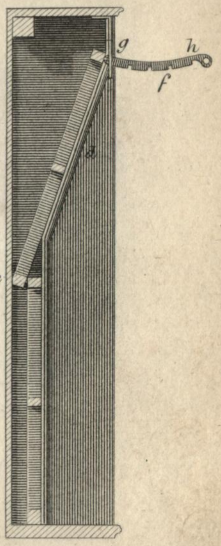


Fig. 6.



Lowry sculp.

A Bounty of THIRTY GUINEAS was this Session voted to Mr. JOHN DE LAFONS, for his communication of a new ESCAPEMENT for WATCHES, a Plate and Description of which are hereunto annexed, and a complete Model reserved in the Society's Repository for the inspection and use of the Public.

SIR,

HAVING considered the perfection of Chronometers to consist more in giving an equal impulse to the balance than to any other general cause, I present, in hopes of the approbation of the Society, the model of a new Escapement, which has not only the property of correcting the errors of the main-spring, train of wheels, &c. and giving an equal power to the balance, but likewise the wheels are locked, without spring-work, perfectly safe from getting out of order, and are unlocked with less power than in any Escapement I know, as the wheels do not bear against the locking with more than a tenth part of the whole pressure from the main-spring; a circumstance I believe to be perfectly new.

Although the giving an equal impulse to the balance has been already most ingeniously done by Mr. Mudge, and by Mr. Haley (from whose great merit I would not wish to detract), yet the extreme difficulty and expense attending the first, and the very compound locking of the second, render them far from completing the desired perfection. Presuming I have simplified the above ideas, I leave it to the Society's judgment to determine the merit of mine.

I am, SIR,
Your obedient servant,
JOHN DE LAFONS.

April 13, 1801.

MR. CHARLES TAYLOR.

Observations on, and Description of, an improved Escapement. Plate IX. Fig. 1, 2, 3, 4, 5.

HIGHLY flattered by the honourable patronage my mechanical attempt has received, after returning my most ardent thanks for the favour of the great attention paid by the Gentlemen of the Committee, I feel it incumbent on me to point out the perfections and advantages arising from my improvements on the Remontoire detached Escapement for Chronometers, which gives a perfectly equal impulse to the balance, and not only entirely removes whatever irregularities arise from the different states of fluidity in the oil, from the train of wheels, or from the main-spring, but does it in a simpler way than any with which I am acquainted. I trust it will not be thought improper in me to answer some objections made at the examination before the Committee, as I am fully persuaded the more mathematically and critically the improvements are investigated, the more perfect they will prove to be.

It was first observed, that my method did not so completely detach the train of wheels from the balance as another Escapement then referred to. I beg leave to remark, that the train of wheels in mine is prevented from pressing against the locking, by the whole power of the remontoire-spring; so that the balance has only to remove the small remaining pressure, which does away that objection, and also that of the disadvantage of detents, as this locking may be compared to a light balance turning on fine pivots, without a pendulum-spring; and has not only the advantage of banking safe at two turns of the balance, and of being firmer and less liable to be out of repair than any locking where spring work is used, but likewise of unlocking with much less power.—It was then observed, it required more power to make it go than usual. Permit me to say, it requires no more power than any other Remontoire Escapement, as the power is applied in the most mechanical manner possible.—And lastly, it was said, that it set or required the balance to vibrate an unusually large arch before the piece would go. This depends on the accuracy of the execution, the proportionate diameter and weight of the balance, the strength of the remontoire-spring, and the length of the pallets. If these circumstances are well attended to, it will set but little more than the most generally detached Escapements.

I proceed to describe mine as follows:

A.	The scape-wheel.
B.	The lever pallet, on an arbor with fine pivots, having at the lower end
C.	The remontoire or spiral spring fixed with a collar and stud, as pendulum-springs are.
D.	The pallet of the verge, having a roller turning in small pivots for the lever pallet to act against.
E.	Pallets to discharge the locking, with a roller between, as in *Fig.* 4.
F.	The arm of the locking pallets continued at the other end to make it poise, having studs and screws to adjust and bank the quantity of motion.
a & *b*.	The locking pallets, being portions of circles, fastened on an arbor turning on fine pivots.
G.	The triple fork, at the end of the arm of the locking pallets.

The centre of the lever-pallet in the draft, is in a right line between the centre of the scape-wheel and the centre of the verge, though in the model it is not; but may be made so or not, as best suits the calliper, &c.

The scape-wheel A, with the tooth 1, is acting on the lever-pallet B, and has wound up the spring C; the verge-pallet D (turning the way represented by the arrow) the moment it comes within the reach of the lever-pallet, the discharging-pallet E, taking hold of one prong of the fork, removes the arm F, and relieves the tooth 3 from the convex part of the lock *a*. The wheel goes forward a little, just sufficient to permit the lever-pallet to pass, while the other end gives the impulse to the balance: the tooth 4 of the wheel is then locked on the concave side of the lock *b*, and the lever-pallet is stopped against the tooth 5, as in *Fig*. 3. So far the operation of giving the impulse, in order again to wind the remontoire-spring (the other pallet at E, in the return, removing the arm F the contrary direction), relieves the tooth 3 from the lock *b*. The wheel again goes forward, almost the whole space, from tooth to tooth, winds the spiral-spring again, and comes into the situation of *Fig*. 1. and thus the whole performance is completed. The end of the lower pallet B resting on the point of the tooth 1, prevents the wheel exerting its full force on the lock *a*, as in *Fig*. 1. The same effect is produced by the pallet laying on the tooth 5, by preventing the wheel from pressing on *b*; and thus the locking becomes the tightest possible. This Escapement may be much simplified by putting a spring with a pallet made in it, as in *Fig*. 5. instead of the lever-pallet and spiral-spring. The operation will be in other respects exactly the same, avoiding the friction of the pivots of the lever-pallet. This method I prefer,

PLATE IX.

M^{r}. I. Delafon's Watch Escapement.

Fig 5.

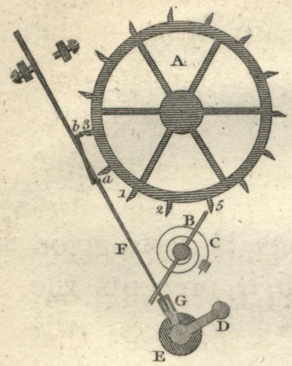


Fig. 3.

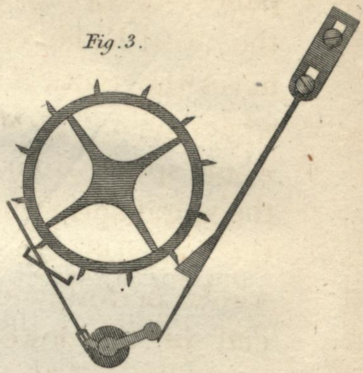


Fig. 1.

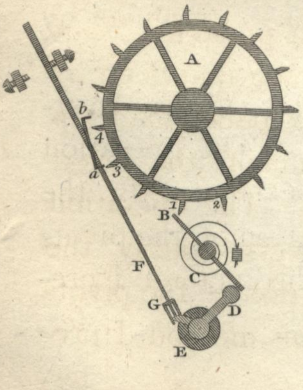


Fig. 2.

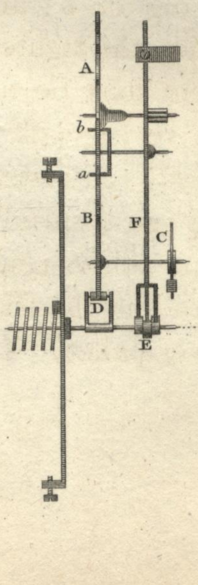
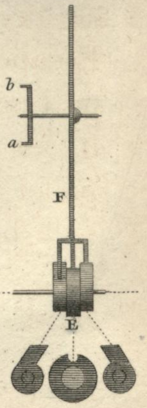


Fig. 4.



Lowry sculp.

fer for a piece to be in a state of rest, as a clock; but the disadvantage, from the weight of the spring in different positions, is obvious.

The locking may be on any two teeth of the wheel, as may be found most convenient.

JOHN DE LAFONS.

Mr. CHARLES TAYLOR.

ERRATA.

Page 302, line 18, for *does not exiſt*, read *does exiſt*.
—— 303, — 23, for *intercourſes*, read *intercourſe*.
—— 304, — 23, for *fevers*, read *fever*.
—— 310, — 13, for *principles*, read *principle*.
—— 311, — 5, for *theſe*, read *the*.
—— —, — 9, for *priſons*, read *priſon*.
—— 312, — 12, for *openneſs*, read *openings*.
—— 313, — 8, for *particularly*, read *particular*.
—— 316, — 15, for *dyſentery*, read *dyſenteric*.
—— 319, — 3, for *that the draft*, read *to accelerate the draft*.
—— —, — 6, dele *is accelerated*.
—— 329, — 16, for *edges*, read *ledges*.